OVERVIEW OF MOTORISED PENDULUM

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ABSTRACT

This paper discusses the significance of a pendulum pump which can be used as a complementary device for pumping water and is made to replace hand pumps. One vital quality of a pump with a pendulum is that the work is alleviated or in easy terms it makes effort rather easier when is compared with a conventional hand water pump. It is due to this underlined quality which enables the pendulum pump to be used as an efficient mode in the irrigation of lesser lots, water-wells and can also be used in extinguishing fires even by aged citizens and children. By the use of pendulum based water pumping structure we can enhance the efficiency of the plant and reduce the effort, cost of manufacturing, manufacturing time, manpower requirement.

Keyword: - *Hand pump, pendulum and effort.*

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1. INTRODUCTION

This assignment presentation shows the significance of a pendulum pump which can be used as a complementary device for pumping water and is made to replace hand pumps. To obtain the water successively out of the pump, the pendulum wants to be out of equilibrium. following that, based on gravitational potential, the piston starts oscillating and the nonstop flow of water is impending out of the output pipe. The pendulum should be infrequently pressed, to maintain the amplitude i.e. the flow of water.

A pump is a device that can be used to lift or transmit fluids. Pumps are chosen for processes not only to lift and transmit fluids from one position to another, but also to meet some other measure. This other measure may be to obtain a steady flow rate or constant pressure according to the requirement.

The main importance of a pendulum pump is that the initiation energy for starting the procedure of pumping, swinging of the pendulum, is considerably minimum when compared with the work necessary to operate hand pumps. Typical hand pumps require sufficiently large effort and an average person can use the pump constantly only for a short time, but the pendulum pump requires only minimum of the effort, because it is only required to swing the pendulum and can keep these oscillations for several hours, without any fatigue. The pump works well with all sizes of the pendulum, but for the most part with the amplitude of 90°.

The benefit of this innovation compared to present hand pump solutions are: less energy to start the pump, less water consumption, both arms can be used to fetch the water. The innovation is applicable on other devices that make use of lever mechanisms, such as a hand press etc.

The most important attribute of this is:

The effect of creating the free energy in the device made of:

1. Oscillating pendulum-lever system,

2. System for initiating and maintaining the swinging of the Pendulum.

2. LITRATURE SURVEY

Lin et al. [2013] from The State Key Laboratory of Fluid Power Transmission and Control, Zhejiang University, China were acquired experimental data from the semi-physical test rig and analysed validate the energy transmission strategy of dual-medium pressuriser. An onshore pendulum WEC test rig is built to validate the above proposals. A hydraulic cylinder is substituted for the wave that exerts force on the pendulum. Although the force and the output power in the simulation are somewhat different from those in the test results, the overall tendency is the same, and the dual power stroke in one period is clearly shown [1].

R. Ortega [2013] from Depto. De Matemática Aplicada, Universidad de Granada, 18071 - Granada, Spain presented the stability of the equilibrium of a pendulum of variable length in terms of the third approximation. In contrast, the traditional linearization procedure is not always faithful. Alternative characterizations of stability are also presented. They are based on degree theory and on the algebraic structure of the symplectic group [2].

Dian-Hong et al. [2013] from department of Mechanical and Electronic Engineering, China University of Geosciences, Wuhan 430074, PR China, amplified the geomagnetic influence on torsion pendulum experiment by producing an additional horizontal magnetic field, and obtained the dissipation, which is proportional to B2 in the disc shaped torsion pendulum experiment. The geomagnetic influence should be considered due to the inelasticity correction in G measurement in high Q-factor torsion pendulum experiments [3].

Sergey V. Kapranov and Guennadi A. Kouzaev [2013] from Department of Electronics and Telecommunication, Norwegian University of Science and Technology, Norway considered the motion of a dipole in external electric fields in the framework of nonlinear pendulum dynamics. A stochastic layer is formed near the separate rix of the dipole pendulum in a restoring static electric field under the periodic perturbation by plane polarized electric fields. The width of the tochastic layer depends on the direction of the forcing field variation, and this width can be evaluated as a function of perturbation frequency, amplitude, and duration [4].

Tao Hana et al. [2013] from Department of Mechanical and Industrial Engineering, University of Illinois at hicago, United States observed a pendulum-like motion of the usually straight electrified jet experimentally and theoretically modeled. Pendulum-like motion arises due to repulsive Coulomb force between the straight electrified jet and the charges accumulated on the collector. This electrical force repels the similarly charged landing jet segment in the collector plane. The motion is transferred to the whole jet via elastic stress sustained by the jet. The initially straight segment of the jet is arched. The pendulum-like motion has frequencies of the order of 10–102 Hz [5].

Rahul Singh and Vijay Kumar [2014] from Dept. of Electronics and Communication Indian Institute of Technology, Roorkee, India presented an approach for the swing up and stabilization of a rotary inverted pendulum (RIP). RIP system is an unstable, multivariable, under actuated and highly nonlinear in nature. RIP consists of a pivot arm; the pivot arm rotates in a horizontal plane by means of a servo motor. The opposite end of the arm is attached to the pendulum rod whose axis is along the radial direction of the motor. The task is to design a controller that swings up the pendulum, and keeps it in upright position. Swing up action is based on the energy principle whereas stabilization uses Takagi Sugeno Fuzzy controller. A mode controller is used to decide which control action is to be implemented. Mode controller is basically a condition check on the angle of the pendulum rod. Finally, MATLAB SIMULATION results reflect the performance of the RIP system with the stated control actions [6].

Denise S.D. Stilling and Walerian Szyszkowski [2014] from Mechanical Engineering Department, University of Saskatchewan, Saskatoon, Canada examined the control of angular oscillations or energy of a system through mass reconfiguration using a variable length pendulum. The interaction between the sliding and angular motions can be used to control the angular oscillations of a system. Simple rules for generating either attenuation or amplification of the oscillations by sliding a mass can be derived by analysing the energy balance or the Coriolis forces [7].

3. OPERATING PRINCIPLE

The pump is made of pendulum, two-leg lever and cylinder with the piston which pumps the water. Swinging of the pendulum is maintained by periodical action of the human arm. Oscillation period of the pendulum is twice bigger than the period of the lever oscillation. Piston of the pump has reverse effect on the lever and damps its oscillation. Damping of the lever motion causes damping of the pendulum, but the work of the force damping the pendulum is less than the work of the forces which damp the lever.

Equilibrium position of the lever is horizontal, and the equilibrium position of the pendulum is vertical. Oscillation of the lever and the pendulum takes place in the same plane, vertical in reference to the ground. Physical model of this type of water pump was shown at a number of exhibitions, in some publications.

4. OBSERVATION AND DISCUSSION

The problems faced in the simple manually operated hand pump is that it requires more human efforts. In this report the major emphasis is given to reduce the human efforts by using free energy of pendulum for running of the pump.

A general study will be done on The various parameters that determine the output discharge of the pendulum pump are analyzed and the results will be plotted. Analysis parameters include mass of pendulum, swing angle, length of pendulum. The analysis in ANSYS will be done in order to simulate the process in which the various stresses and the dimensional study will be carried out. The simulated results will be compared with the practical results for verification.

5. REASERCH OBJECTIVE

Primary object of the present invention is to provide an apparatus for pumping of water with the help of oscillating energy of pendulum.

- To provide cost effective, easy to operate, portable
- To provide motor operated pendulum pump which is compact so that it can easily installed and easy to carry from one place to another.
- Yet another object of the present invention is to provide a more reliable pump than ones which have the restriction of more power consumption
- Yet another object of the present invention is to provide a pump with long life.
- Yet another object of the present invention is to provide a pump which can be dual operated through motor as well as manually.

6. REASERCH METHODOLOGY

- System Design
- Mechanical Design
- Simulate the Process by Using ANSYS as finite element analysis Software.
- Validation with Experimental results

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